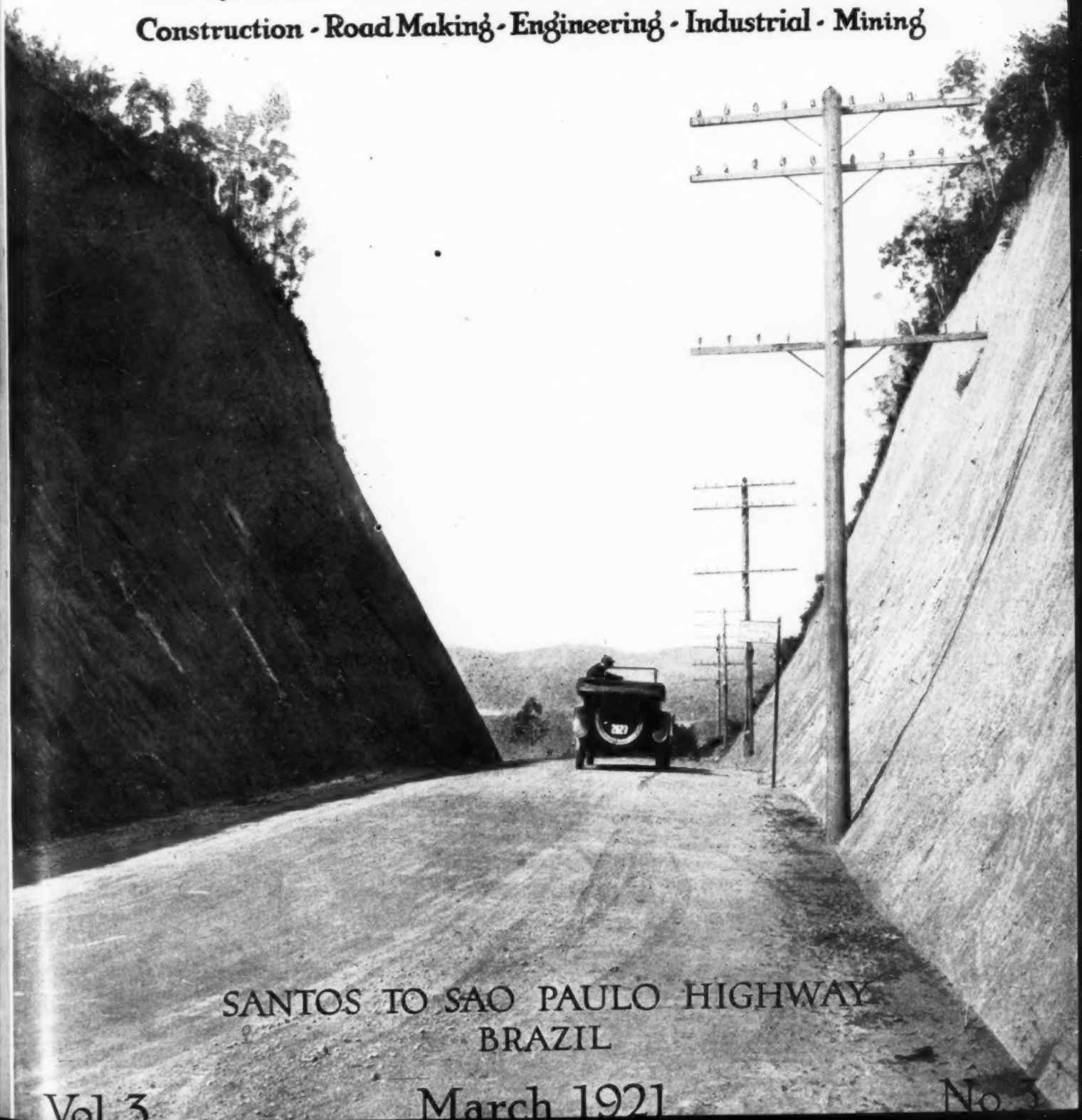


Successful Methods

Construction • Road Making • Engineering • Industrial • Mining



SANTOS TO SAO PAULO HIGHWAY
BRAZIL

Vol 3

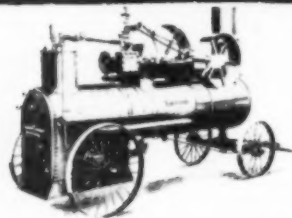
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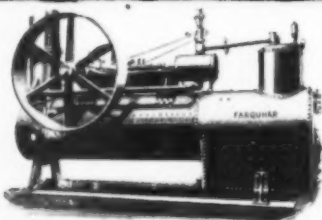
Steam vs. Gasoline



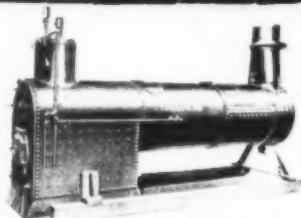
Ajax Center Crank Engine—Detached



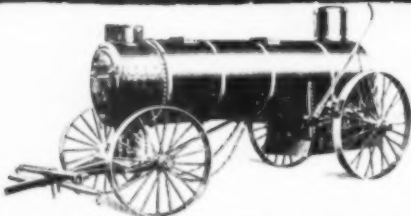
Ajax Center Crank Engine on Locomotive Boiler on Wheels



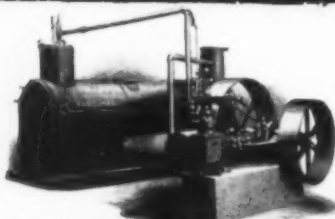
Ajax Center Crank Engine on Locomotive Boiler on Sills



Locomotive Boiler on Sills—Semi-Portable



Locomotive Boiler on Wheels—Portable



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—initial cost and upkeep of steam engines are less.

—there are fewer moving parts on steam engines and lubrication is simplified. No carburetor, magneto or timer to get out of order.

—steam power is more flexible—no gears to shift, and practically no vibration.

—steam power may be distributed easily and used for thawing out piles of materials, for heating "shacks" and for many other purposes.

—these are a few of the facts—a few of the reasons why contractors on the big jobs prefer steam.

The Farquhar line of steam equipment for contractors is complete. We offer both single and double cylinder tractions. Also locomotive rigs, bare boilers and detached engines as illustrated as well as vertical stationary outfits, etc.

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WILLIAM JABINE, Secretary and Editorial Director

141 Centre St., New York City, N. Y.

Vol. III

MARCH, 1921

No. 3

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But there is plenty of room to sound a note of optimism, to declare that things are not as bad as they seem. There is considerably more building going on throughout the country than the average person realizes. In every city the inquirer is told that there is nothing doing in the building line, but he does not have to walk far to discover that the pessimistic statement is considerably exaggerated.

The railroad situation is a little more complicated but there is no reason for despair. This nation always has gone forward, always has found its way out of difficulties, and it will continue to do so.

And the great construction industry in all its branches is so big and important a part of the national life, that it cannot fail to go forward, too.

Opportunities in South America

A MERICAN construction men should consider the opportunities "to grow up with the country" in many parts of South America. Few of them have even thought of what they might accomplish down there. Those who have, generally figure on landing with one of the large American corporations which have in recent years conducted extensive operations in the countries south of the Canal. There have been good openings in that direction. There will be many in the future. But the more attractive prospects lie in building an organization to take local contracts.

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Without going into the reasons why, it is sufficient to know that several American construction men are making good below the Equator as contractors. These men were first employed by different American corporations on local construction work. They got the run of the

labor, material and business conditions. When they launched out on small jobs of their own they used American methods and machinery adapted to these conditions. They have succeeded in competing with the hand methods usually employed by native contractors.

These few successes do not indicate that all that is needed is a willingness to try, nor should the fact that there are many very capable and successful local contractors be overlooked. The results obtained in the last two or three years by the Americans mentioned do show, however, that there is an opening for good men.

There are no set specifications for the kind of men who can make good on this opportunity. But first of all, a man must be something of a pioneer. He must enjoy the experiences of a new country. He must be adaptable to strange customs and to business methods different from our own. Most important of all, he must have the same kind of ability and experience that are needed to make good here.

With all of these qualifications, any man who tackles the proposition will have to go against many discouragements. He will find business conditions bad now in most of these countries. But the latter are largely undeveloped. They are rich in resources. They lack population and engineering works. They are almost certain to go ahead rapidly in the comparatively near future. The construction men who get in now have a splendid chance to build a satisfactory business.

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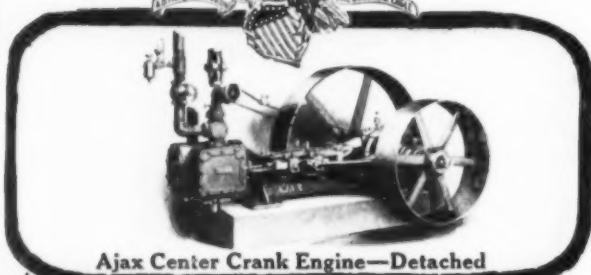
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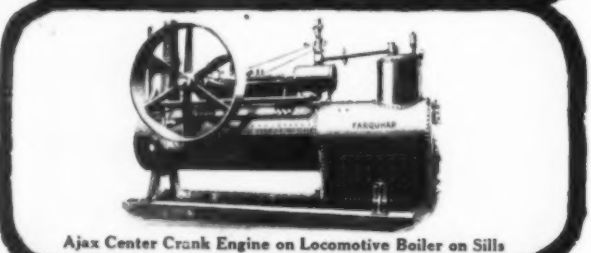
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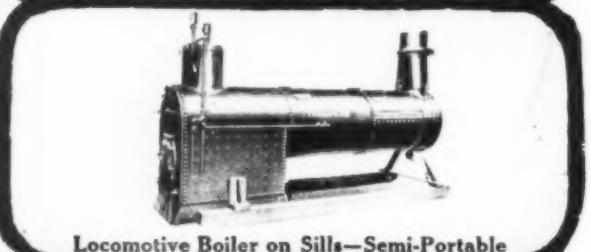
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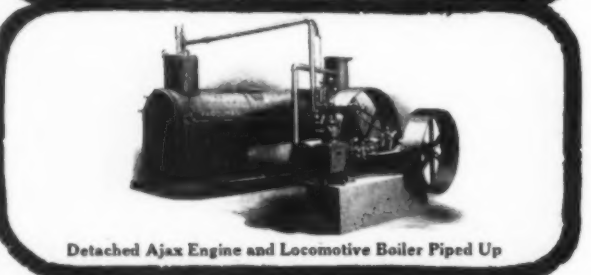
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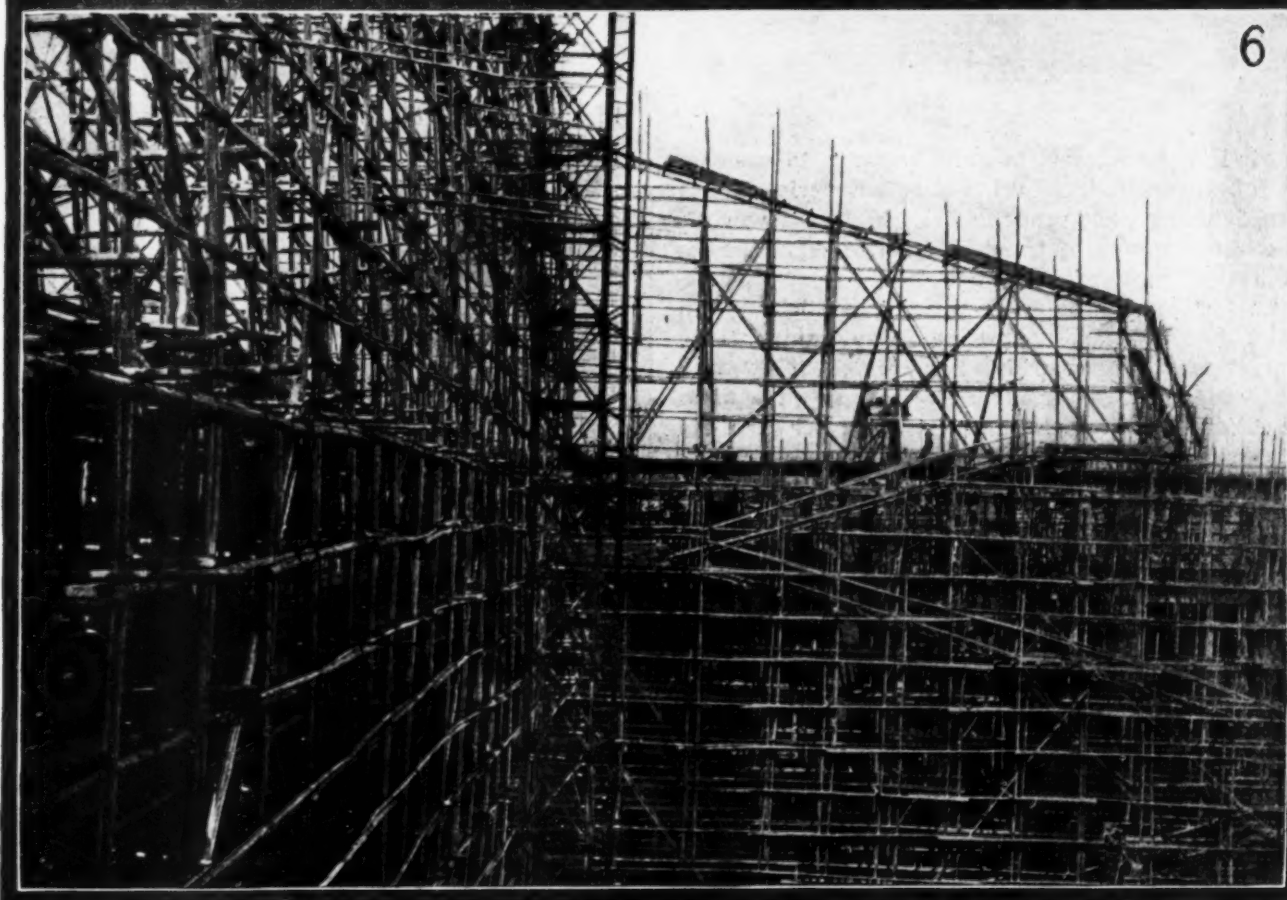
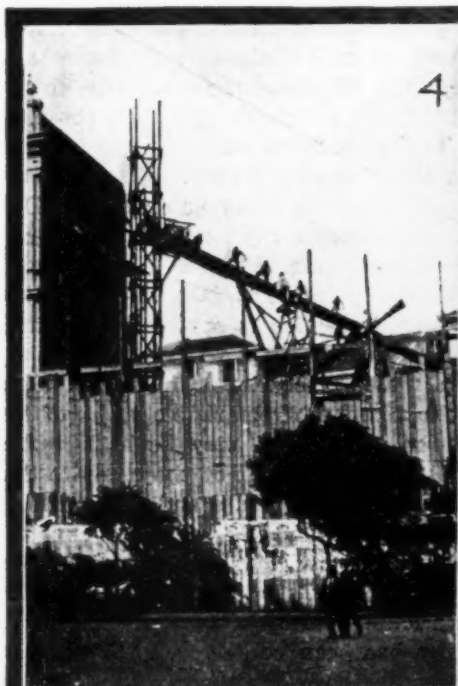
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Fighting the Building Shortage



1—Three Los Angeles girls building an adobe house with their own hands. (©Keystone Views.) 2—An 18-story concrete building goes up during the winter months in the "swamp," the leather district in downtown New York. (© International.) 3—How they work in Africa. Any able-bodied contractor who studies this picture will know exactly how to do the job himself. (© International.)

In Every Corner of the World



4—Down in Chile they still use wooden chutes for concrete, making it necessary to employ a big gang to keep the concrete moving. 5—Former German soldiers building homes on land given to them by the government. (© Wide World Photos.) 6—The remarkable network of scaffolding surrounding a new building in Japan. It is hard to discover the building. No nails are used in erecting the staging. (© International.)

HIGHWAY PROGRESS IN BRAZIL

By S. T. HENRY

HIGHWAY building is one of the foremost subjects of national interest in Brazil to-day. This is true in spite of the fact that there are probably not more than 1500 miles of even fairly good roads in that vast country. Indeed, this very lack of usable highways is one condition that has aroused national interest in the need for them.

Absence of any kind of transportation has held back vast areas of rich Brazilian territory in which the climate is quite suitable to the white race. At present



A HIGHWAY NEAR RIO

costs, it is impracticable to build railways to open up most of these undeveloped areas. Experience has shown, however, that properly built highways will afford adequate means of transportation to begin the development of these primitive sections.

Even in the southern states of Brazil, which contain most of the wealth and population of the country, there are practically no good roads. For example, it has until recently been impossible to travel more than a few miles out of Rio de Janeiro on a road which a motor car could negotiate at all seasons of the year. In the state of Sao Paulo, one of the richest agricultural sections in the world, most of the coffee, cotton and other products are delivered to the railroad in two-wheeled carts, or on muleback—because there are no roads.

Road building already has been started on a considerable scale in several of the southern states. The state of Sao Paulo has taken the lead in this work. One of the first projects completed in that state was a private automobile toll road, 48 miles long, which extends from Santos to the city of Sao Paulo. Public highways also have been built in the last year or two out of Sao Paulo for long distances into the interior. Up-country in that state there are a number of local road schemes radiating from centers of population, and in some cases they extend continuously to several cities and towns.

The Santos-Sao Paulo automobile toll road was built entirely by private subscription. Santos, which is the largest coffee shipping port in the world, lies at sea level in an area all of which originally was tidal swamp.

Sao Paulo, with a population of 550,000 inhabitants, is one of the most promising of all the South American cities. It lies about 48 miles inland from Santos and at an elevation of 3000 ft. above the sea. Due to the elevation and latitude in which the city is located, it has a climate in which northern Europeans and North Americans retain their natural energy. Cheap hydro-electric power also is available in ample quantity. Due to these and other conditions many large and important industries already have developed there.

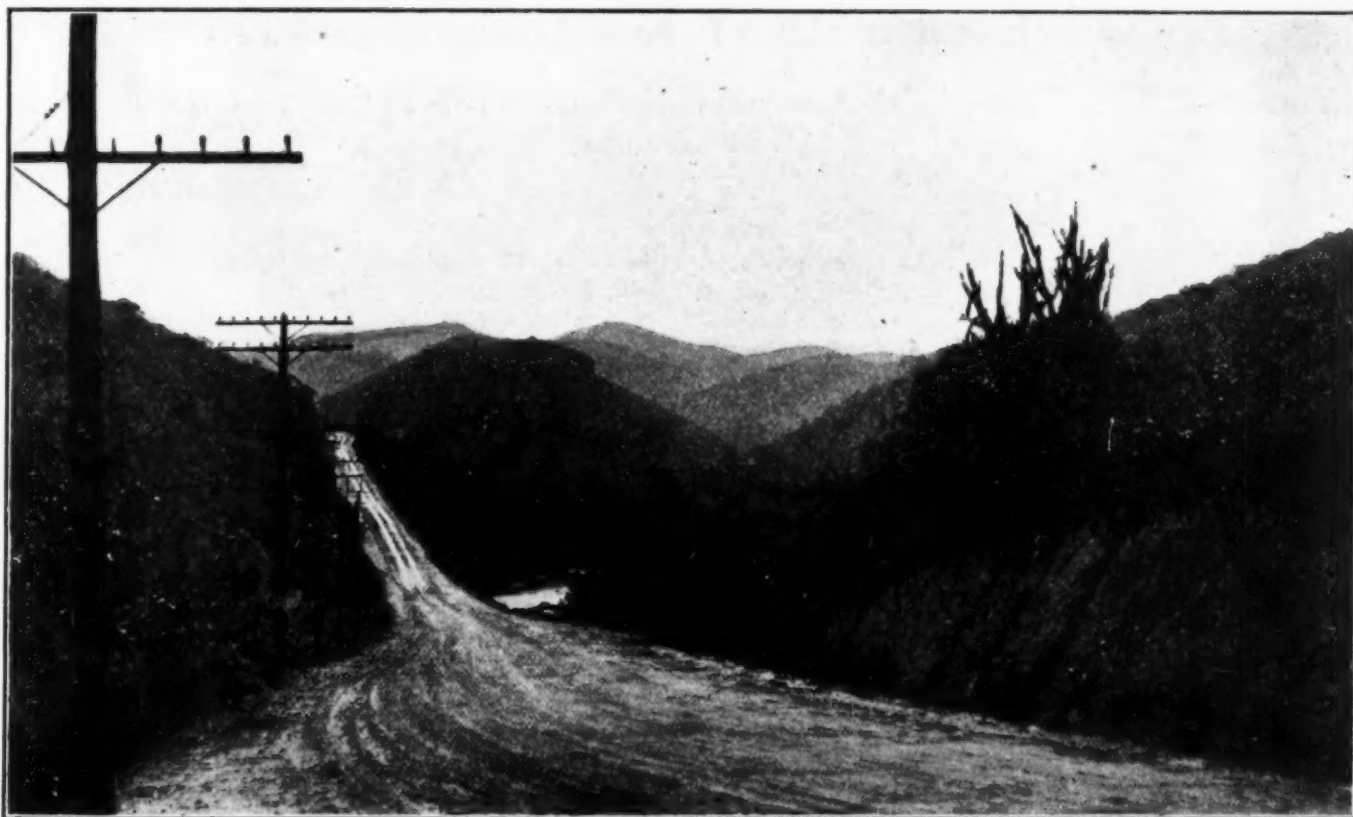
Across the tidal swamp in the vicinity of Santos the highway is built on a fill which is surfaced with macadam. After crossing the swamp, the road climbs up the mountains on winding locations through a dense tropical jungle. In this climb remarkable views of the flat country and the sea beyond may be had at frequent intervals. From the summit of the climb to Sao Paulo the road is on excellent grades and in good locations through a picturesque rolling, hilly country. Some of the accompanying photographs were taken on a trip over this road. They give an idea of the character of the construction and location. In some places macadam ballasting has been necessary. For most of the length of the road, however, the surface consists of a natural disintegrated stone, similar to the novaculite which is used so successfully for road building in western Tennessee and Kentucky and in southern Illinois.

In the vicinity of the city of Sao Paulo and up-country in the state of that name, soil and climatic



THE NIEMEYER ROAD NEAR RIO

conditions are quite similar to those which occur in northern Georgia. There is, however, rarely any frost and the ground never freezes. The roads that are being built through this part of the country are on good grades and locations. No attempt has been made to surface them as yet. Conditions are ripe in practically all of the roads in that state that were visited on a recent trip to Brazil to utilize sand-clay construction effectively. Until the traffic over the roads increases beyond anything that is at present in sight, this type of construction should be ample.



A PICTURESQUE STRETCH OF NATURAL SURFACED HIGHWAY IN THE STATE OF SAO PAULO

Rio de Janeiro is a city of more than a million population. It occupies one of the most picturesque sites imaginable, lying among broken, irregular hills and valleys and facing a wonderful bay and the ocean. Within the city there are a number of remarkably beautiful avenues and drives which are surfaced with as good asphalt construction as may be found in any North American city. These drives also are located along the bay and the ocean, where they provide marvelous views of the picturesque surroundings. It seems strange to find that these wonderful avenues end abruptly at the edge of the city on roads that are mere cart trails.

A number of highways were built early in the nineteenth century by the Portuguese from Rio de Janeiro into the interior. These old roads had fallen completely into disuse, due to lack of maintenance. In the last two years several of these old roads have been opened up and resurfaced in fairly satisfactory condition. As a result it is now possible to travel over about 150 miles of fairly good roads in the vicinity of Rio de Janeiro. These roads lead directly into the mountains. From many places on them there are unexcelled views of the city and its surroundings. These roads also are the beginning of a scheme for extending a long distance into the interior. Work already has been done on isolated road projects radiating from, and connecting various inland cities. This completed will make a long trunk line a possibility in the comparatively near future.

Climatic and soil conditions in Rio de Janeiro and vicinity also are favorable to the economical construction and maintenance of good road surfaces. On account of the broken, rugged character of the country, however, grading work will be expensive and difficult in many sections. These same topographic conditions,

on the other hand, render railroad construction so expensive that, as previously mentioned, highways are more practicable.

Some of the other southern states of Brazil have done a considerable amount of highway building in the last few years. An extensive road project is under consideration now in the state of Ceara in connection with plans for several great irrigation projects which the Government has planned to build in the near future. This project must be carried out before the irrigation works can be started properly.

In the city of Pernambuco and the vicinity plans for building roads and streets also are likely to be put into execution promptly as a result of a bond issue floated locally in that city late last year. The fact that it was possible to raise locally nearly \$2,000,000 on this bond issue indicates the keen interest in the need for better roads and streets. It also signifies that there is much private wealth in Brazil which can be marshalled to support a properly presented local and national highway program.

North American contractors and engineers should consider seriously the possibilities open to them as a result of the nation-wide interest in Brazil for better roads. They should know that Brazil is not all jungle and swamp, but that it offers probably the greatest opportunities of any of the South American countries to get returns on the investment of foreign capital and ability. In considering these possibilities engineers and contractors from this country should keep in mind that there are many local individuals and concerns who have shown their ability to do the work which is contemplated thoroughly well. The best way in which to meet this local competition would doubtless be by means of the use of better methods and more machinery.

CONVEYORS SOLVE BUILDING PROBLEM

Contractor Uses Them With Intermediate Storage Pile to Carry Materials Over Soft Ground

By D. B. FRISBIE

HAVE you ever had to put up a four-story steel and concrete building 200 ft. by 400 ft. on a tide-water marsh? That is what the Barney Ahlers Co. of New York has undertaken for the Robert Gair Co. at Montville, Conn., and the problems encountered have been solved by the use of unusual and efficient methods.

The land on which the Robert Gair Company decided to put up its factory building was a broad alluvial shelf on the bank of the Thames River about ten miles above New London. At low tide it was a fine factory site but at high tide it was a better fish pond. When Barney Ahlers started the job, his first move was to build a good solid fence of piles to keep the fish out. Then three feet of mud was pumped from the river side of the cofferdam to the Gair Company's side. This soupy proposition underfoot further complicated the material handling problem, for the only practical way of getting materials to the site of the work was by water, and the nearest point where

the water was deep enough for barges or lighters was about 300 ft. from the factory site. Even at high tide the barges could not get within 100 ft. of the shore.

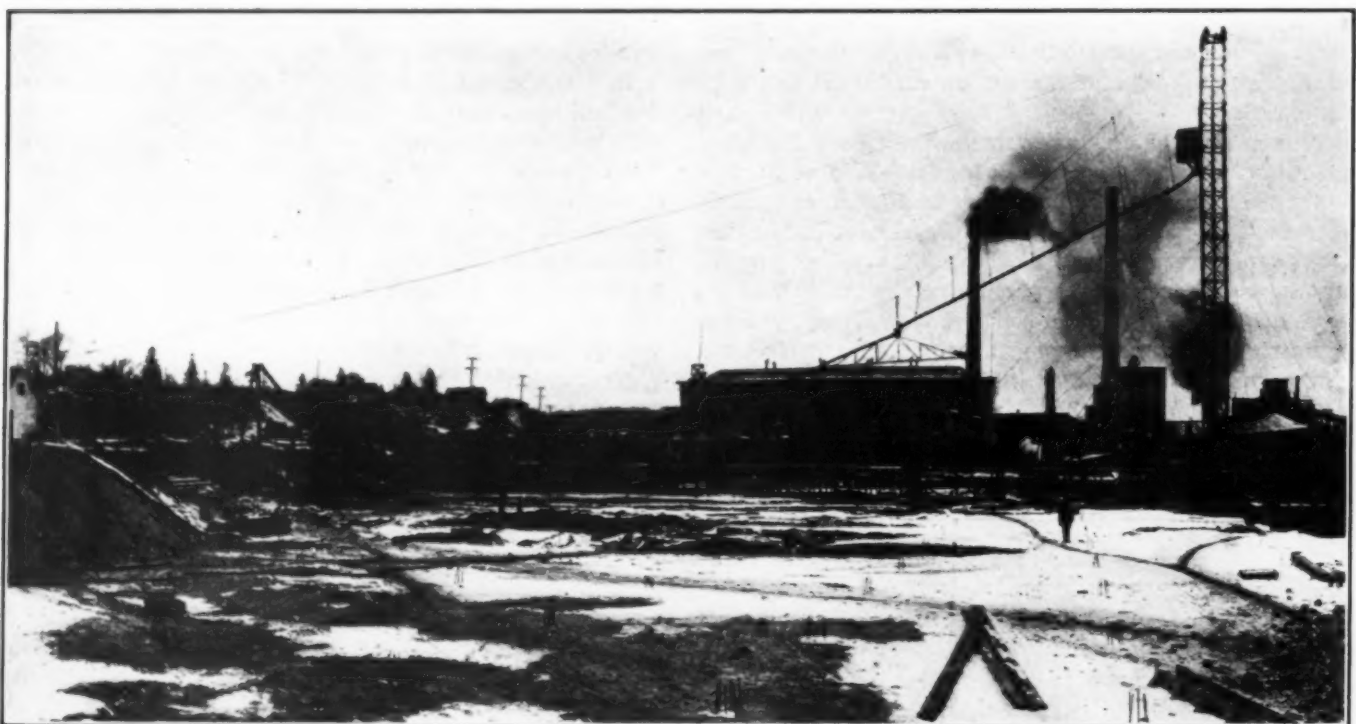
Conveyors furnished the solution of the difficult problem.

A pier was built extending into the river so that barges could come alongside. The materials were unloaded from the barges with a clam-shell bucket into a bin built above the hopper of a 125-ft. conveyor belt extending shoreward and rising at an angle of about 20°. This conveyor carried the material to the shore and deposited it in a large

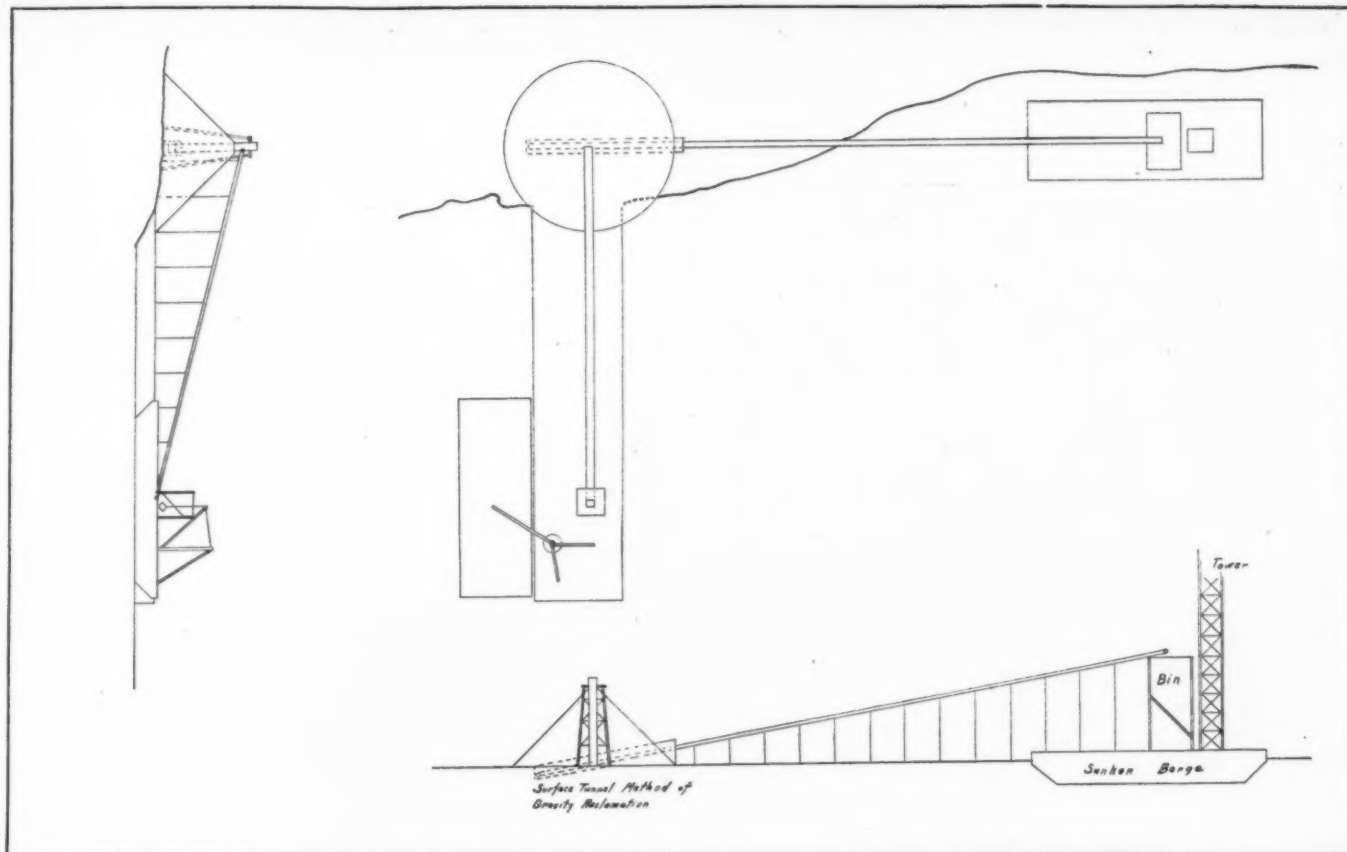
circular pile over a surface tunnel into which another conveyor ran. This second conveyor extended from the tunnel along the side of the factory site 279 ft. to a bin situated over the mixer. The mixer, cement storage bin and chuting tower all were put on a sunken car float such as is used to transport freight cars about New York harbor. All of the building operations were conducted from points outside the actual building lines.



THE CONVEYOR LAYOUT BEFORE ANY MATERIAL WAS HANDLED, TAKEN FROM A BOAT IN THE RIVER



A GENERAL VIEW OF THE JOB. THIS HALF SHOWS THE MIXING PLANT, WHICH IS ON A SUNKEN BARGE, CHUTING EQUIPMENT AND SITE OF NEW BUILDING

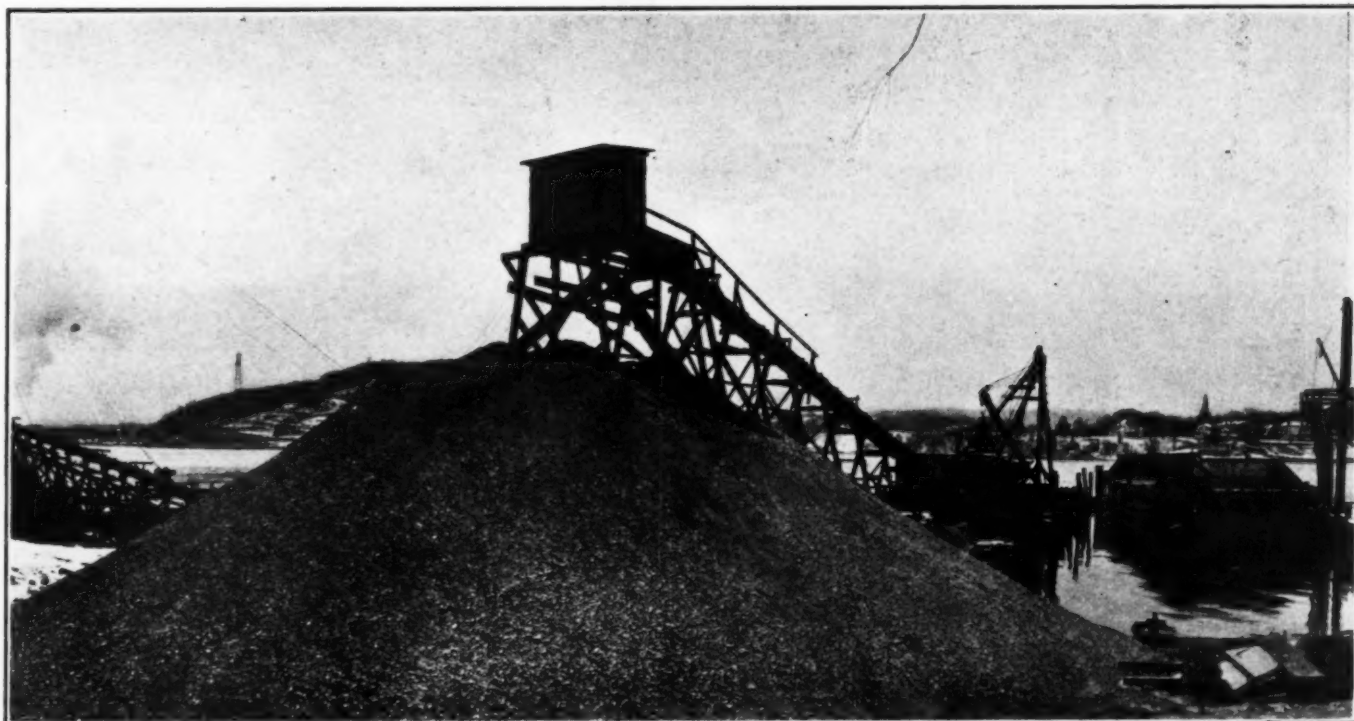


A PLAN OF THE CONVEYOR LAYOUT

The diagram and photographs on these pages illustrate to manner in which the job was handled. In the smaller picture at the top of the left-hand page the conveyor from the pier to the shore is shown before any of the material was put in the storage pile. Part of the conveyor from the storage pile to the mixer can be seen emerging from the surface tunnel at the right of the photograph. This intermediate storage pile makes it

possible to reclaim 50 per cent of the material by gravity. The pictures at the bottom of the pages show both conveyors and storage pile. The tunnel and chute may be seen in the background. The diagram shows clearly the arrangement of conveyors and other equipment.

Work was begun on this job last fall and the concreting will be carried on throughout the winter months.



THE CONVEYOR AND INTERMEDIATE STORAGE PILE ARE SHOWN IN THIS HALF OF THE PHOTOGRAPH WITH A BARGE AT THE PIER

Modern Methods Combat Old Enemy



New York's most successful fight against a snowstorm began on Sunday, Feb. 20, when about a foot of snow fell in 24 hours, and the city's mechanical snow fighters went into action for the first time. The photographs show (above) a plow mounted on a truck; (at the right) a new type of snow loader; (below) a tractor pulling a blade machine

© International



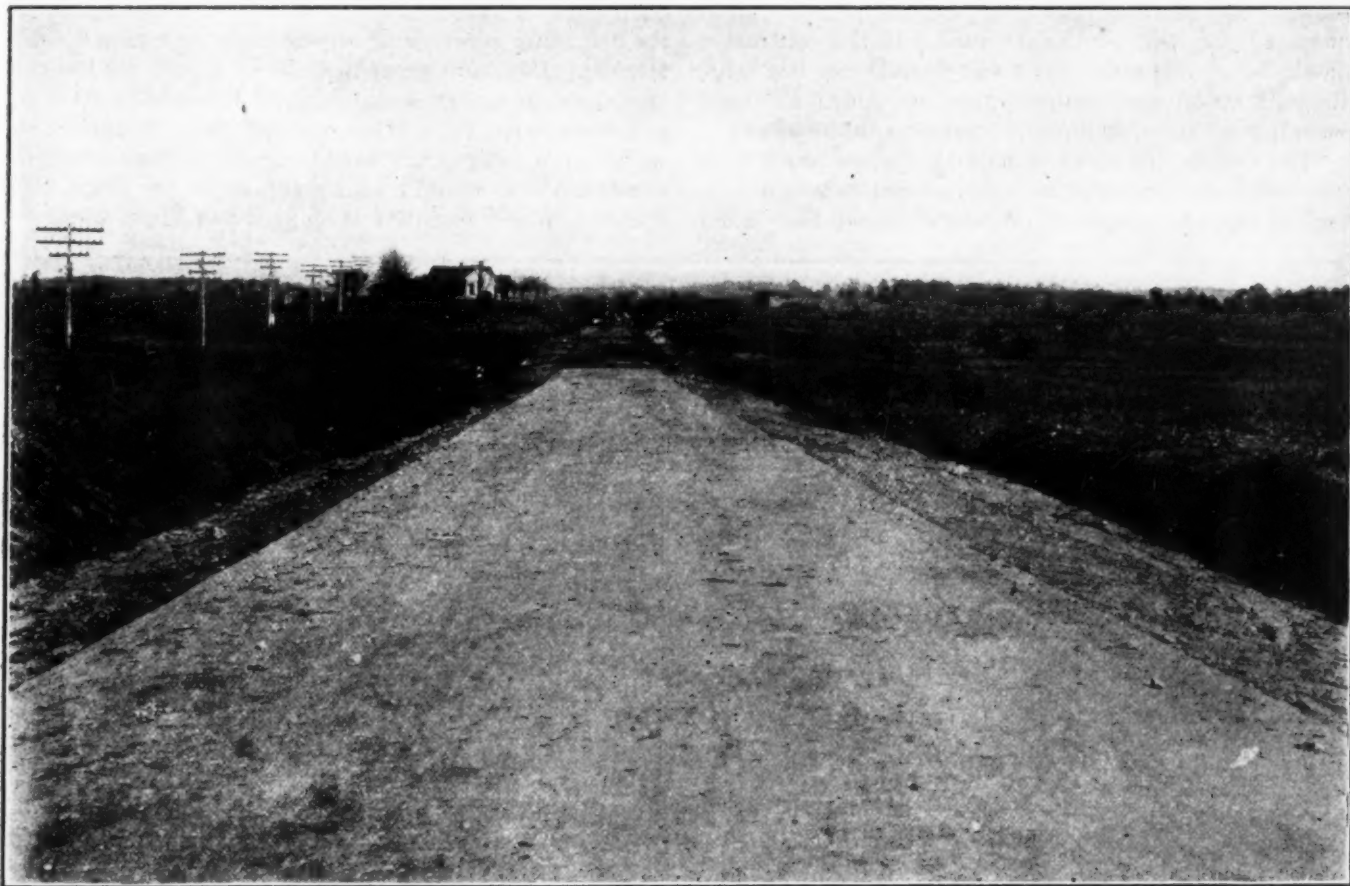
HOW GEORGIA SAVES MONEY

New Form of Contract for Highway Work Is Working Well—Contractor Also Profits

NEARLY a year ago SUCCESSFUL METHODS printed an article by W. R. Neel, State Highway Engineer of Georgia, describing a new form of contract which Mr. Neel had devised and which he intended to try out. This new form of contract, which is known officially as Form "B," combines the principles of cost-plus-a-fixed-fee and competitive bidding. The following excerpts from an address delivered by Mr. Neel before the Amer-

bonding companies, realizing the greater risk, demanded of the contractor higher bidding. On several occasions contractors have informed me after the bids had been rejected that they were willing to submit a lower bid, but could not secure a bond if they did so.

"It therefore appeared to me that in order to meet this situation, it would be necessary for the State of Georgia to carry a large part of the risk, and, briefly,



A SECTION OF ROAD NEAR NEWNAN BUILT UNDER A FORM "B" CONTRACT

ican Association of State Highway Officials tells the story of the initiation and form of the new contract.

"In approaching the demand for a new form of contract in Georgia, I was confronted with a constantly ascending scale of unit prices, each succeeding set of bids being a little higher than those preceding, until it was a question of either suspending the letting of new contracts or of devising a means of decreasing the cost of the work. I do not wish to place all the blame for the excessively high bidding upon the contractors, they in turn, being under the fear and actual conditions of constantly ascending prices for material and labor, together with the uncertainty of freight rates, until no one knew where he stood nor how to bid. It was a gamble, as the old form of contract always has been, with the odds heavily against the contractor, and, as a consequence, the high bidding. Furthermore, every one was affected by the many uncertainties, and the

the actual use of the present form of contract immediately produced the desired results in decreasing the cost of the work to the State.

"The use of this form of contract does not eliminate competition. The contractor, in submitting his bid, divides it into two parts; the estimated cost and the desired compensation. In order to have an incentive to keep down the cost, the contractor is allowed 25 per cent of any saving on the estimated cost, provided it does not exceed 50 per cent of the total compensation in the proposal, and should the cost exceed the estimate, 50 per cent of this excess is deducted from the compensation, with the provision that the compensation must not be reduced more than 75 per cent. Therefore, the contractor is assured of at least 25 per cent of the compensation, as shown in his bid, for which he must furnish, at his expense, a superintendent and any overhead expense, such as the maintenance of his general

office. It is calculated that the 25 per cent will allow the contractor to break even with no loss other than that of his time.

"The contract also provides for a machinery and equipment rental, a form being provided which must be filled out and which forms a part of the contract cost of work. However, the rental schedule is fixed, and only the interest on the value of the equipment is allowed plus a fair compensation for depreciation, insurance and estimated repairs. In this way, no profit can be made other than that shown as compensation, and this amount varies with the skill and zeal used in prosecution of the work. Thus the minimum compensation obtainable by the contractor will be 25 per cent of the compensation shown in the bid, and the maximum will be the compensation shown in the bid plus an additional 50 per cent of this amount. If the contractor should be so fortunate, the owner should not begrudge him this additional compensation, as additional compensation means a saving of 75 per cent to the owner.

"The cost of the work is paid by the owner, who is required to pay promptly all bills in order to take advantage of any cash discounts. A bonded accountant in the

the immediate delivery of all necessary materials for the vigorous prosecution of the work as soon as practical after the awarding of the contract.

"The contractor is called upon to furnish the necessary equipment, and a skilled organization properly directed by an experienced and efficient superintendent. The elimination from the requirements of the contractors of practically all financing results in a considerable reduction in the compensation demanded by them, so that this is practically net profit to the State under this form of contract.

"At first thought it might appear that the compensation of a contractor could be saved by an organization operated by the Highway Department, but analysis makes it evident that the item of compensation of a contractor, if conservative, would closely correspond to the operating expenses of an organization owned by the Highway Department, and, while it should not be the case, I am afraid in actual practice it would be hard to get supervision for a state contract in an organization working on salary that would exert the same effort in construction as would a contractor, under the Form "B" contract, where incentive in dollars and cents would be



THE WHEELBARROW AND SHOVEL GANG AT WORK ON THE NEWMAN JOB. LABOR IS MORE PLENTIFUL IN GEORGIA THAN IN SOME OTHER STATES

employ of the owner makes up pay-rolls and supervises the paying of all labor, etc. All materials are purchased by the purchasing agent of the State Highway Department, and the prices for all materials, f.o.b. railroad siding, are included in the proposal. In this way, the only financing required by the contractor is in purchasing of equipment pertaining to the job, and in paying the salary of his Superintendent. This has resulted in

to keep the construction cost under the estimate. At the same time the estimate must be conservative in order to meet the competitive feature.

"In addition to this objection to a state construction organization, there would be the enormous investment in equipment which could only be used on state highway work, whereas, a contractor has for a field, not only state highways within the state, but in other states.

"One of the first advantages in this new form of contract is that it permits honest contractors of small means to show their ability on a larger scale than would be possible under the old form under which a surety bond is required for the full amount of the contract, which many contractors of small means are unable to make. At the same time, the facilities for financing this Form "B" Contract open a field for intelligent, honest bidders who would otherwise be unable to participate in a project of very great magnitude, except as sub-contractors, although their ability might be ample to handle the project. A striking example of this is a recently completed concrete paving project. The successful bidders could not have financed a project of this extent under the old form of contract and yet they have had charge of the construction of more miles of concrete pavement within the state than any other contractor."

Since the contract was first put into effect last spring, several road jobs have been conducted under its provisions, and at present the contracts now under way under Form "B" amount to more than \$1,500,000 and a saving of a little more than \$20,000 has been effected in bond premiums alone.

The biggest job done under Form "B" was a 5½ mile stretch of road near Newman, Georgia, being built by Lowe & Rader of Macon, Georgia. The project provides for 12½ miles of 18-ft. concrete pavement, 10 of which have been awarded thus far. The first concrete was laid on August 7 last and by November 4, 5½ miles had been completed. The cost figures on this work show a 15 per cent net saving on the contract as

The Figures Tell the Story

	Actual	Estimated	Saving
55,172 sq. yd. 6 in.	\$131,567.37	\$160,688.45	\$29,121.08
5.089 mi. machine grading	3,973.81	3,358.74	- 16.62
979 cu. yd. excavation		538.45
5.202 mi. shoulder ditch slopes	3,667.06	5,202.00	1,534.94
40 lin. ft. 15-in. D.S.V.C. pipe	68.90	120.00	51.10
26.54 cu. yd. Class A concrete	524.26	743.12	218.86
Cost of work	\$139,741.40	\$170,650.76	\$30,909.36
Machinery rent	6,246.64	7,172.36	
Fixed compensation	14,146.62	14,146.62	
Total cost of work	\$153,888.02	\$184,797.38	
25 per cent saving not to exceed 50 per cent of fixed fee	7,073.31		
Total cost to State	\$160,961.33		
Net saving to State	23,836.05		

the course of the work show clearly how the contract worked out.

The contractor did the work at a cost of \$30,909.36 less than the estimate. The table shows the main items on which this saving was effected. Under the contract he was entitled to an additional fee of 25 per cent of the amount saved, but this 25 per cent could not exceed 50 per cent of the fixed fee, which in this case was \$14,146.62. This made his additional compensation \$7,073.31, which, added to the total cost of the work, made the total saving to the state on the entire job \$23,836.05. The cost per square yard of concrete was \$2.9122.

Mr. Neel does not regard this contract as perfect, although naturally he is well pleased with the results obtained thus far. He is going ahead with it and is making improvements in it wherever he sees the need for them. The use of the contract requires a high grade inspector and a thorough knowledge of costs on the part of the engineer. Future work under Form "B" contract undoubtedly will be watched with keen interest by those to whom is entrusted the great task of building the roads of the country.

ROADBUILDERS GATHER IN CHICAGO

THE advantage of a large centrally located city over a smaller one as a meeting place for a convention or show of national scope and importance was well demonstrated by the great success of the Eleventh American Good Roads Congress and the Eighteenth Annual Convention of the American Road Builders Association, held in conjunction with the Twelfth National Good Roads Show last month in Chicago.

The idea behind the Congress and show which were held in the Coliseum under one roof, was to bring into closer relation those interested in highway work; to disseminate information and stimulate interest in the latest developments in highway construction; to exhibit for the benefit of road builders, highway officials, and others the latest in road-building machinery, materials, methods and appliances. The measure of success achieved may be gained by the fact that the list of exhibitors of the above was 150, and more than 5,000 delegates and visitors registered during the four days.

The prevailing spirit of the congress was one of optimism for the coming season, nearly all the speakers voicing the belief that the interests of the country would be best served by carrying on the program of highway construction with the funds now available.

M. J. Faherty, President of the American Road Builders Association, presided over the first session, and from then on addresses, papers and discussions covered all phases of road building from the Pressed Molasses and Calico roads described by James H. MacDonald, former State Highway Commissioner, New Haven, Conn., to roads for 50-ton trucks predicted by H. C. Sylvester, Vice-President National City Co., New York. Mr. Sylvester in his talk on Highway Finance pointed out the extreme importance of not having the life of the bonds exceed the life of the roads, further stating that in no event should the life of highway bonds exceed 30 years. Many other phases of the road situation were covered both by papers and discussions.

WYOMING'S EXPERIMENT IN PRECASTING SLABS FOR CONCRETE HIGHWAY

The State Highway Department Lays 2400 Foot Section of New Type of Pavement on the Busy Salt Creek Road

By C. H. BOWMAN, District Superintendent,
Wyoming State Highway Department

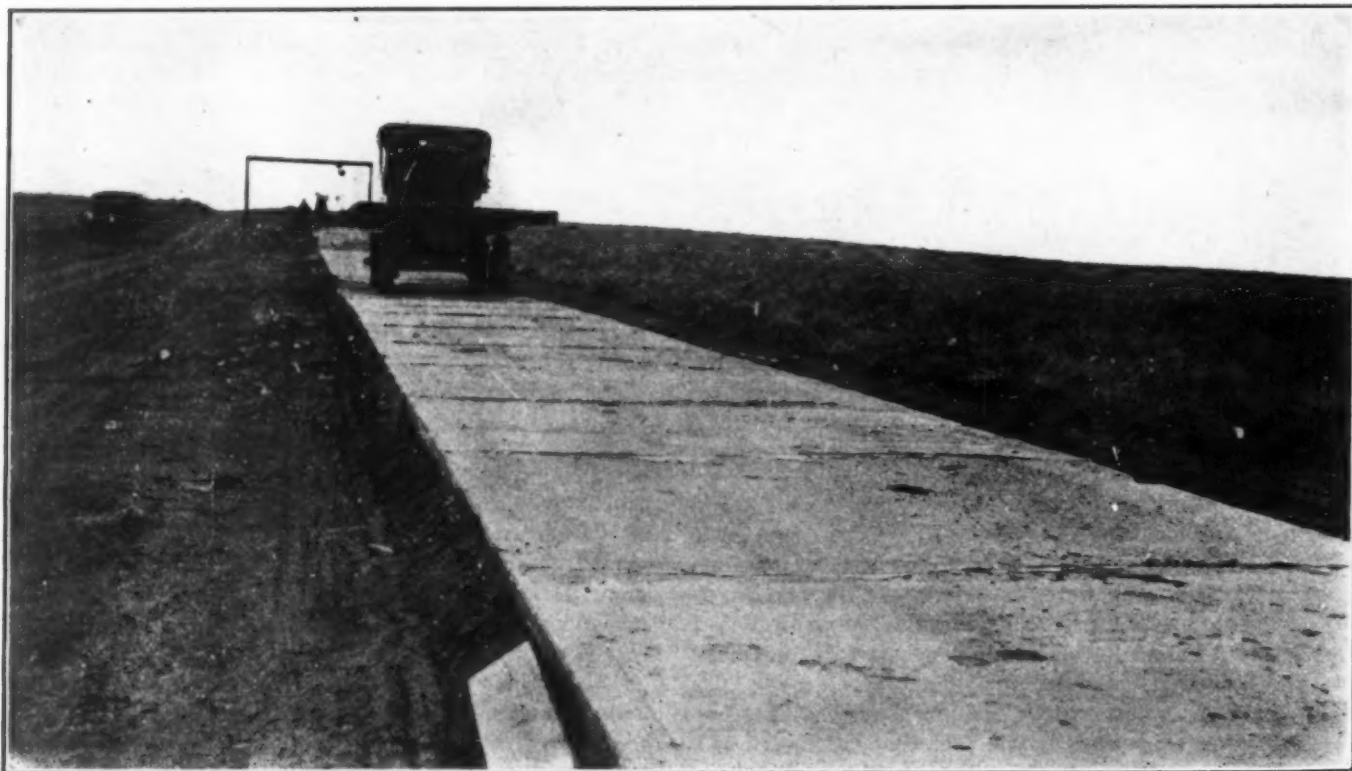
ON one of the busiest highways in the country the experiment of laying a section of pavement composed of precast concrete slabs has recently been completed. This experiment is the work of the Wyoming State Highway Department which during the month of December last laid 2400 ft. of precast slabs on the road from Casper to Salt Creek, a stretch of highway which is subject to extremely heavy traffic because of the fact that it is the only outlet of the Salt Creek oil field.

Oil was discovered in the Salt Creek field 44 miles north of Casper, now known to be one of the best fields in the world from a producer's standpoint, in 1886. Active development started in 1911. With the beginning of drilling operations the trail between Casper and Salt Creek was soon lined with many string teams hauling building material, oil well and commissary supplies. In 1916 the first motor truck made its appearance on this trail. Teamsters with their 16 and 24 horse string teams, who had struggled with their loads of freight across the sticky gumbo flats during the spring thaws and across the sandy stretches in the hot, dry summer months, predicted speedy disaster to the interloper. Nevertheless, despite high centers and bad road conditions this truck stayed with the game and the trucks increased rapidly in number while the number of teams decreased correspondingly.

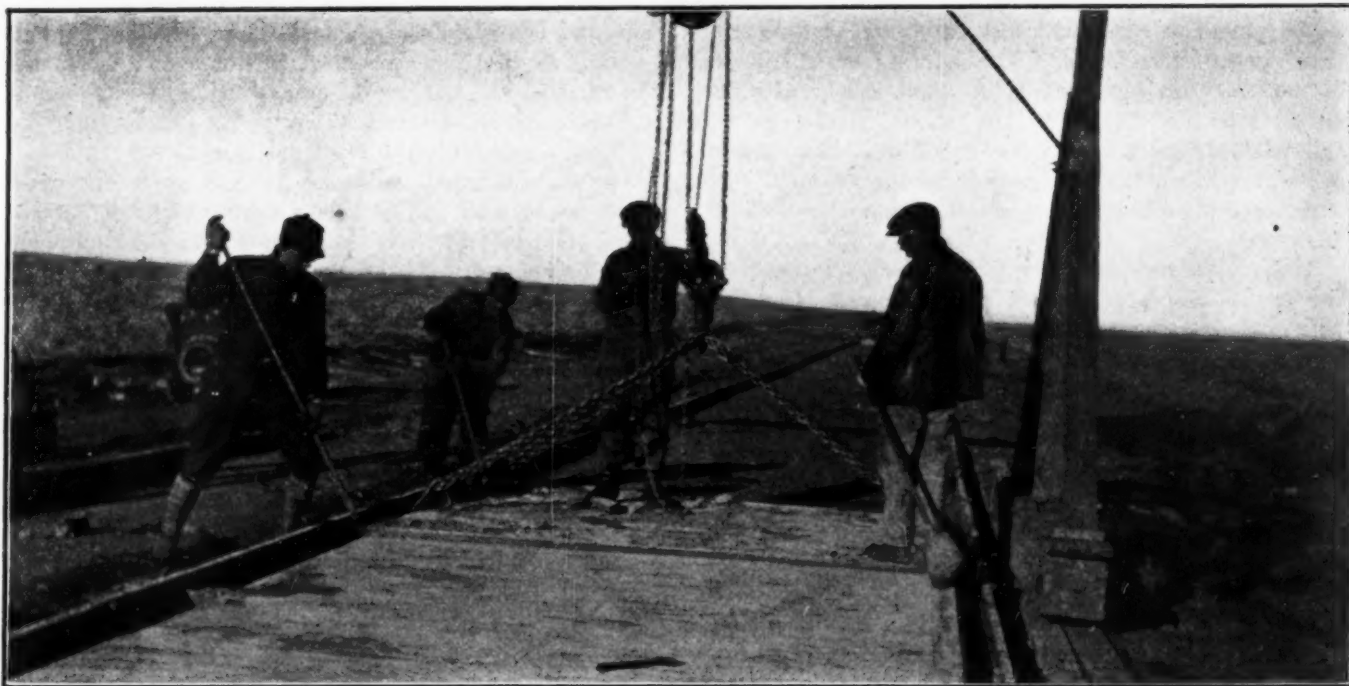
With the advent of so many trucks in the hauling field the agitation for road improvement began, and in 1917 the County, State and Midwest Oil Company joined in a Federal Aid Project reaching north from Casper 39 miles. This 39-mile stretch was graded and provided with proper drainage structures and the first 5 miles north of Casper were paved with concrete 16 feet wide, this work being finished in 1919. During 1920 the remaining 5 miles to Salt Creek have been graded and drainage structures installed preparatory to paving.

Although these improvements greatly facilitated the motor vehicle traffic, the great increase in number of vehicles made the transportation problem an increasingly difficult one. By late spring of 1920 the tonnage passing over this road had increased until in a single month the Midwest Oil Company, the leading producing company in this field, loaded out 6,000,000 lb. of freight from their warehouses. A conservative estimate of the tonnage hauled by other companies during the same month is 4,000,000 lb. When the motor trucks required to haul this tonnage are considered and another 100 motor vehicles per day added, the necessity for a hard-surface road of the best type is apparent.

Plans were made by the State Highway Department for a concrete pavement the remaining distance of unpaved road, 39 miles. Thorough investigation of the



TRANSPORTING THE SLABS BY MOTOR TRUCK—NEARING THE END OF THE JOURNEY



LOWERING A SLAB INTO PLACE ON THE PREPARED SUB GRADE

country on both sides of the road developed the fact that the only source of supply for aggregates was in the gravel bars of the Platte River at Casper, and that there was no dependable source of water supply anywhere north of Casper on this road. The long haul for aggregates and other materials, the necessity of a heavy expenditure for pumping plant and the scarcity of labor during the post-war conditions of 1918 and 1919 prevented the Department from going ahead with this work.

While the State Highway Department was conducting studies of the surfacing problem on the Salt Creek Road, the idea was conceived of casting this pavement in slabs at Casper, the source of aggregate and water supply. By so doing the pavement could be placed at a minimum of interference with traffic, a minimum of camp expense, a minimum of equipment expense and a minimum of labor. War Department trucks of the Maintenance Division of the State Highway Department were available for the hauling.

The Midwest Oil Company and the Bureau of Public Roads were asked to contribute 50 per cent each to the construction of this precast slab pavement. There were many doubting Thomases as to the probable success of the undertaking, but the State Highway Superintendent, D. S. McCalman, finally got the approval of the Bureau of Public Roads for an experimental section 2400 ft. long, the Bureau paying half the cost and the Midwest Oil Company the other half.

The Wyoming laws provide that State highway construction work costing more than \$2,000 shall be done by contract. As there was plenty of work for contractors at high prices, great difficulty was experienced in letting a contract at reasonable prices on this proposed new type of pavement. However, in September, 1920, a contract was let by the Highway Commission to the Levy Construction Company of Denver, Colorado.

Reinforced concrete slabs 6 in. x 8 ft. x 9 ft. with wire mesh and 8 1/2-in. bars were designed by the State

Highway Department and approved by the Bureau of Public Roads. Six different types of joints were planned, giving a trial section 400 feet long for each type of joint. Type "A" joint consisted of a reverse curve, warped surface with radii of 9 ft. 10 in. and 8 ft. 1 in. Type "B" was similar but with the two curves of the warped surface having radii of 4 ft. 8 in. and 6 ft. 5 in. Type "C" joint was an ordinary right angle joint. Types "D" and "E" joints had a batter of 2 ft. 9 in. and 1 ft. 9 in., while Type "F" had four sets of interlocking U bolts locked with a 5/8-in. rod. All joints to be sealed with a bituminous filler.

The pouring of the slabs did not start until October, and before this work was completed in November there was considerable freezing weather and temperatures as low as 12 above zero were recorded. Although the work was handicapped by snow and cold weather, the aggregates and water were heated to prevent freezing.

The slabs were laid in December, during which month there were several snow storms and the thermometer went to 6 below zero. Anyone who knows the Wyoming winter, with its constant high winds, will realize that conditions for slab laying were far from ideal. This work was under the close supervision of the State Highway Department, and the hauling was done with the State Highway trucks by the Maintenance Division.

The loading and unloading apparatus consisted of A frames mounted on 10-in. I-beams for trolley tracks. Three-ton trolleys with 3-ton triplex chain hoists were used for raising and placing the slabs.

The cost of casting was high on account of the experimental nature of the work and the high overhead for the amount of pavement cast, as well as the cold weather conditions encountered. The cost per yard would have been greatly reduced on a larger contract, as the Levy Construction Company bid just twice as much per yard for casting a 2400-ft. section as they bid for casting a 2-mile section. The cost of preparing the sub-grade was high because of frequent freezes, but as the soil where

the pavement was laid was very sandy, no trouble from heaving was anticipated. The hauling cost, allowing \$6 per day for depreciation on each truck, was 39c. per ton-mile.

This 9-ft. slab pavement has been laid on one side of the center line of 24 ft. roadway so that another strip of the same width can be added on the other side of the road.

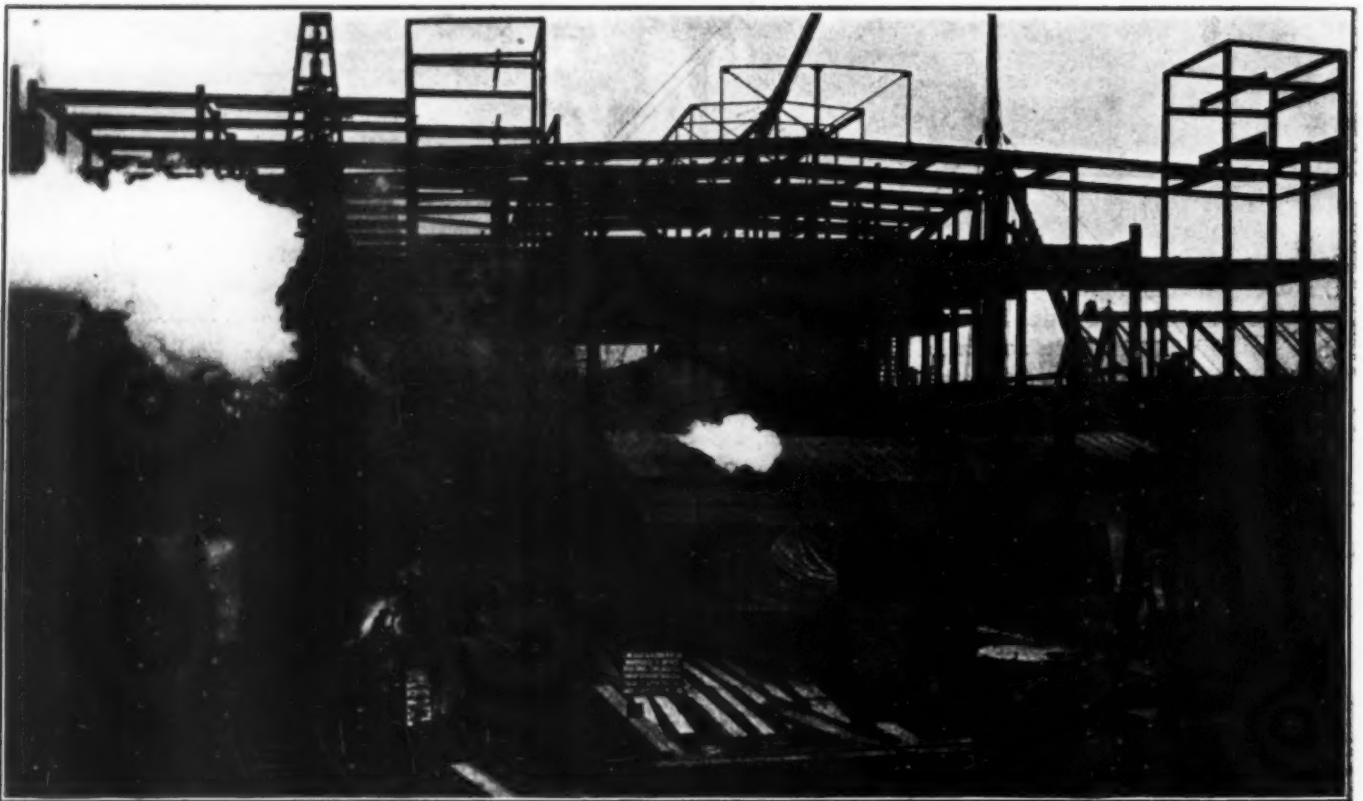
At the time this article is written heavy truck traffic has been passing over this slab pavement for some

time and the excellent surface of the pavement shows no sign of the displacement that some critics feared. The relative value of the different types of joints cannot at this time be determined, although apparently the interlocking joint is the least desirable.

Although the real value of such a pavement on a heavy-traffic road can only be determined after several years' trial, a service has been rendered to the Engineering Profession in demonstrating that a precast slab pavement can be built successfully.

CRANES AND TRAVELER WORK TOGETHER

All Steel on Site Before Erection Began on C. & A. Freight-house in Chicago



THE accompanying photograph shows the method used by Dwight P. Robinson & Co. to erect 2200 of the 2400 tons of structural steel in the new combination freight-house, warehouse and office building which is being constructed at Harrison Street and the Chicago River, as part of the new terminal facilities of the Chicago & Alton Railroad.

Two locomotive cranes, one on each side of the traveler (the crane on the right cannot be seen in the picture) worked in unison with a double boomed trav-

eler along the entire side of the structure. In addition to doing their share of the actual erection, the cranes served the traveler with material. By this means the same speed and progress was maintained along the whole working face. No work was started until all the steel had been delivered on the site. Steel erection (first three floors 2200 tons) was started Oct. 11 and finished Dec. 9, 1920. The remaining two floors, 200 tons, were put up with small derricks, mounted in the usual manner at the third-story level.

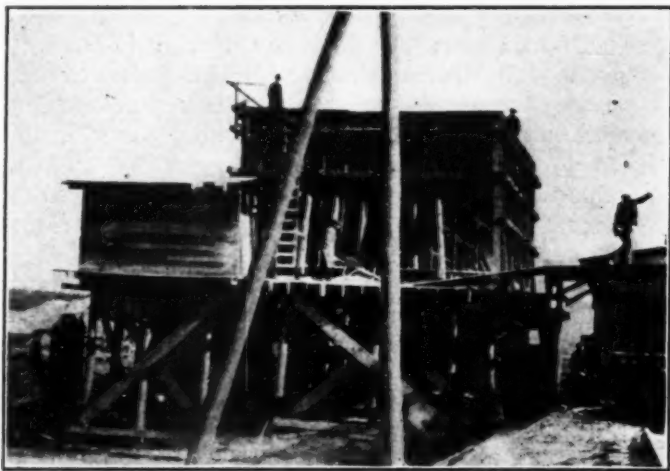
A Correction

IN the article which appeared on pages 12 and 13 of the February issue of SUCCESSFUL METHODS describing a road job near Pottstown, Pa., the contractors were named as Winston Bros. This should have been Winston & Co., a well-known organization

with offices at Pottstown, Pa., and Richmond, Va. It should not, of course, be confused with Winston Bros. of Minneapolis, a firm equally well known in the construction field and which has done notable work in the Northwest.

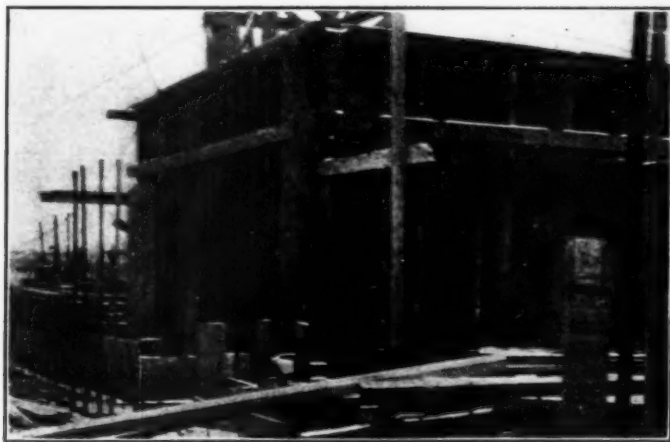
A Comparison in Costs

A GOOD argument for the standardization of plant when conditions make it possible is afforded on a job near Chicago where two material bins of the same capacity were constructed side by side but by dif-



ECONOMICALLY BUILT

ferent contractors. The studding on one is 2 by 8's on 18 in. centers and on the other bin of 3 by 12's on 12 in. centers. The difference is due to the fact that each foreman built his own bin according to his own ideas and no attempt was made by the company in charge of the



MONEY WASTED HERE

work to standardize any of this sort of equipment. As a result both bins are doing the same work and one contains considerably more lumber than the other. The photographs accompanying this article show the two bins.

Ditch Digging Saves Sheathing

INSTEAD of "being kidded by experts," the Mellon, Stuart, Nelson Co. succeeded in kidding the experts by excavating 80,000 cu. yd. of sand and quicksand to a depth of 26 ft. in a swamp, the water in which was 2 ft. lower than the surface of the Calumet River, without the use of sheathing. Around the site of the Commonwealth Electric Co.'s new power station on the Calumet River at 100th Street, South Chicago, 300 by 350 ft., a ditch was dug by means of a dragline, the waste bank being made on the side

away from the work. The ditch was then pumped and kept dry by means of centrifugal and piston pumps.

The excavation proper was then made with the dragline, the material being disposed of by standard gage 12-yd. cars. Only in places where the quicksand overlaid a stratum of clay was it necessary to use sheathing, and then only short 2 in. lagging was used. This method of making a deep excavation in the swampy Calumet River District was a decided departure from the ordinary, and effected a great saving in sheathing.

Motor Rollers Win Race

ANY arguments which might arise as to the relative speed and pulling strength of steam as against motor-driven road rollers was settled to the satisfaction of delegates to the Good Roads Convention when huge 10-ton rollers of both types



THE GREAT ROLLER RACE

competed at Harvey, Ill. Both the half-mile race and the tug of war were easily won by the gasoline machines, a record of 6.58½ being established in the former.

A New Steel Road Form

RECENT tests by the Bureau of Public Roads at Washington and the highway departments of several states have shown the tremendous importance of having the wearing surface of a road perfectly smooth, free from waves or rough spots in the surface. It has come to be generally recognized that the type of form used has a direct and important



A NEW STEEL ROAD FORM

relation to the wearing surface of the finished road.

As compared to other forms, the new steel form shown in the illustration is somewhat lighter in the main section, but has 5 heavy stiffeners to each 10-ft. section; the stakepockets are heavier; no loose keys; no rivets in top of form.

THE UNION CLUB IN SANTIAGO, CHILE

WHEN the Union Club of Santiago, Chile, decided it needed a new building, not only location and design were considered, but construction as well. It was specified, therefore, that modern labor-saving machinery be used for erection.

The new building—a picture of the model is shown



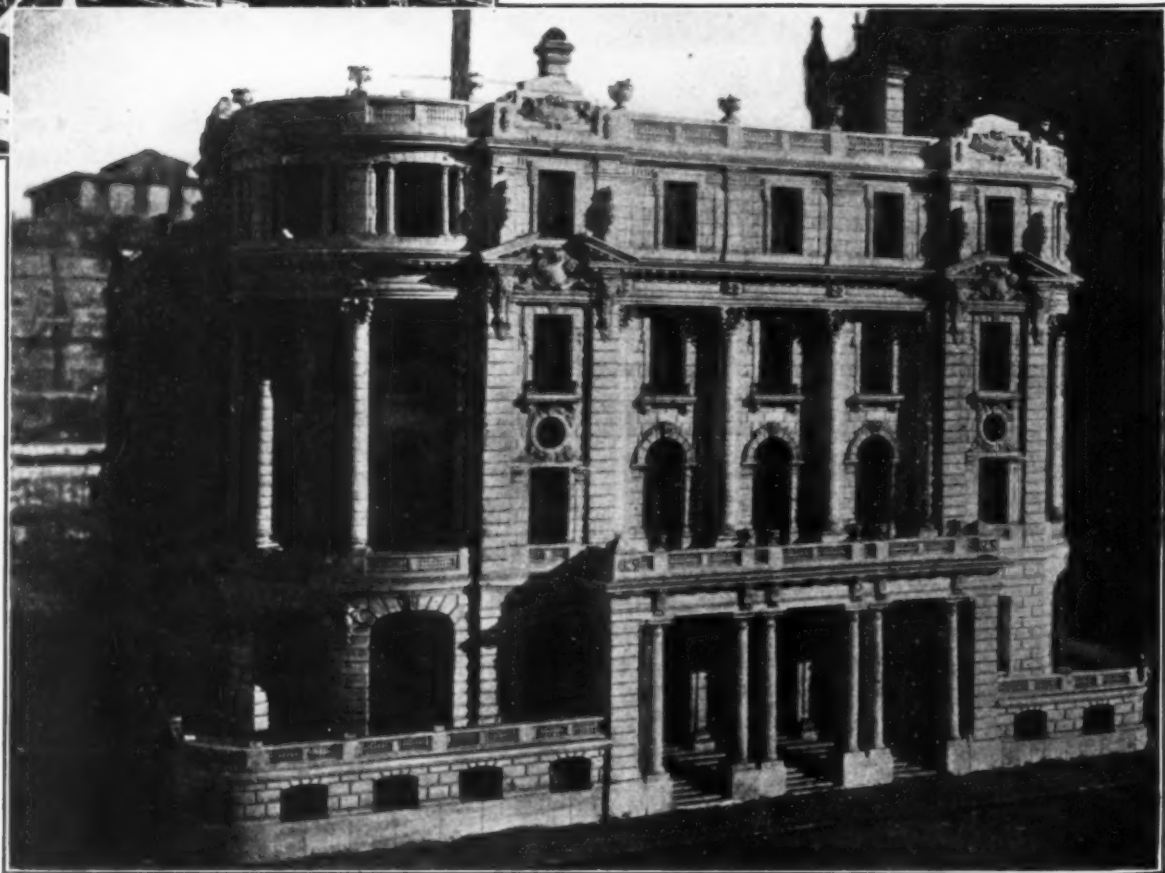
Work in progress on the Union Club, Santiago, Chile, and a photograph of a model of the new clubhouse

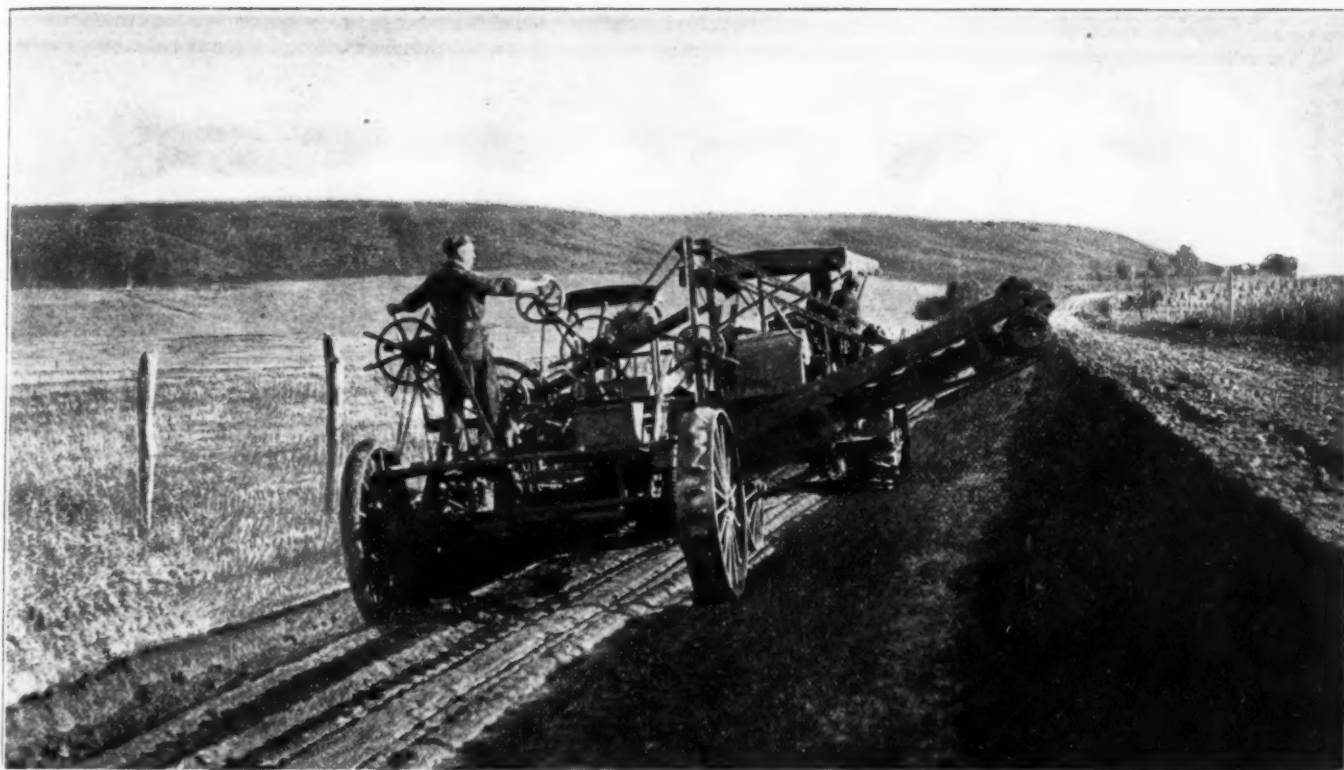
below—is located on the most picturesque avenue in Santiago. Its engineering is unusual in that the reinforced concrete frame is designed to resist the frequent earthquakes prevalent in that district.

The contractors, Sociedad Nacional de Buques y Maderas, and their engineers, Messrs. Colovitch and Margo, recommended the plan of using labor-saving machinery. The biggest single item of labor on the job is in connection with the placing of about 17,000 cubic yards of concrete. This problem was solved by using a steel tower and a gravity concrete distributing system.

The upper picture shows a general view of the work in progress. Concrete chuting equipment enables the contractors to make a saving of \$1.00 per cubic yard compared with the hand-labor methods commonly used in Chile. These results were secured in spite of the so-called cheap labor of Chile. This success promises a rapid increase in the use of labor-saving machinery of this class in that country.

The photograph of the model shown is in itself unusual. After the model was constructed a photograph was taken of the site and enlarged to the scale of the model. Then the model was placed before the enlarged photograph and the picture shown here was taken. The result shows the model before the same background that will be behind the finished structure. This is going a step or two further in the use of models than is usual in this country, and is a good reminder of the fact that all of the clever tricks in the world are not products of Yankee ingenuity.





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PRESENT DAY road builders have recognized the advantages of the "New Era" in solving their grading difficulties. It is good for both grading and excavating the road bed; in the latter case getting the material out of the grade to the wagon or ditch *in one movement* is a worth-while labor-saving achievement.

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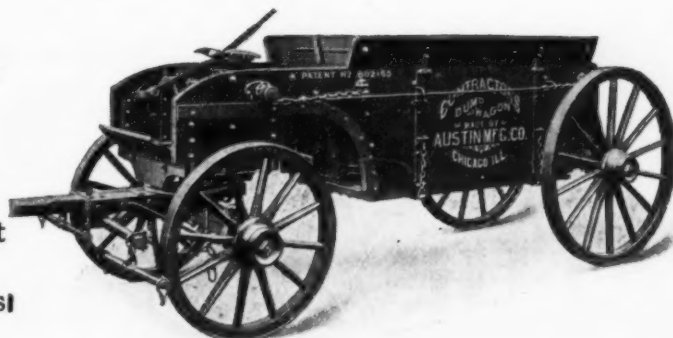
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Easy to dump (hingeless
doors clear the material).



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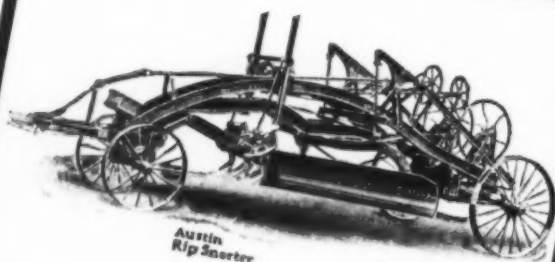
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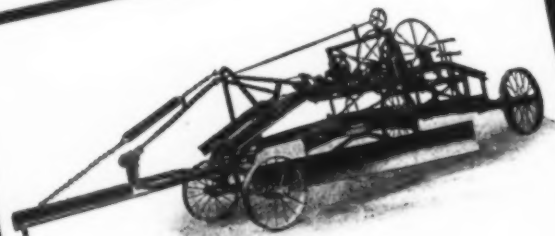
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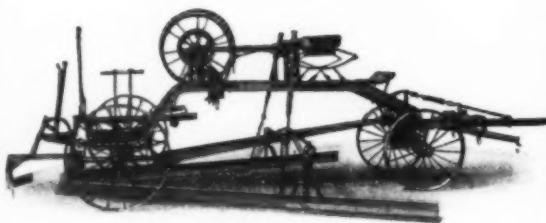


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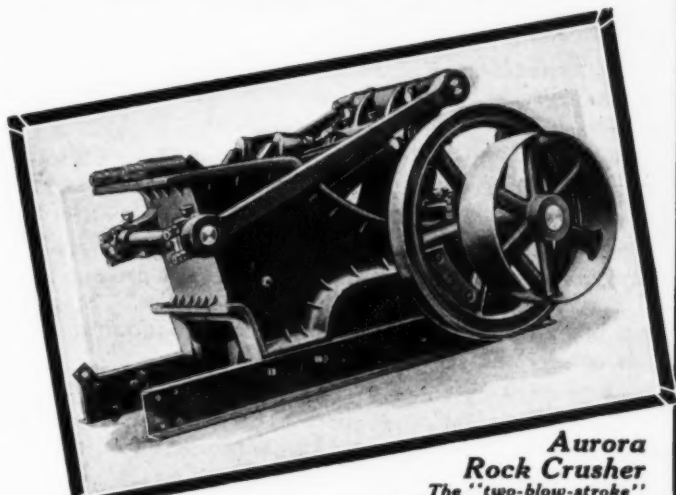
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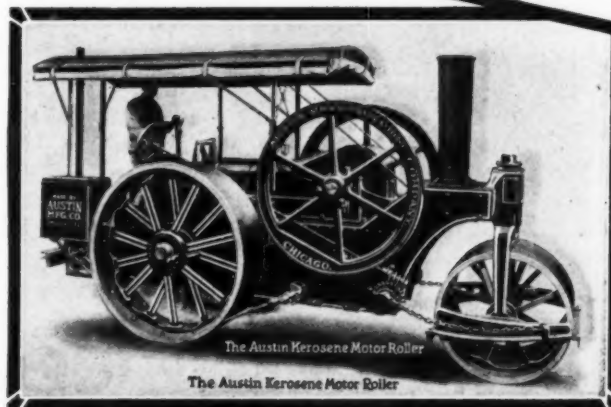
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This important feature in-
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Low Costs in Loading

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Self-Feeder—Rotating discs eliminate necessity for shovelers to feed the buckets.

Note: All B-G Loaders may be identified by their patented feeding discs.

Crawler Traction—Full length continuous treads, 58" long by 8" wide. Track cast integral with the link, self-cleaning, with chain and sprocket thoroughly protected.

Transmission—Truck type with cut gears, fully enclosed running in oil. Differential permits small turning radius—machine can turn around in its own length.

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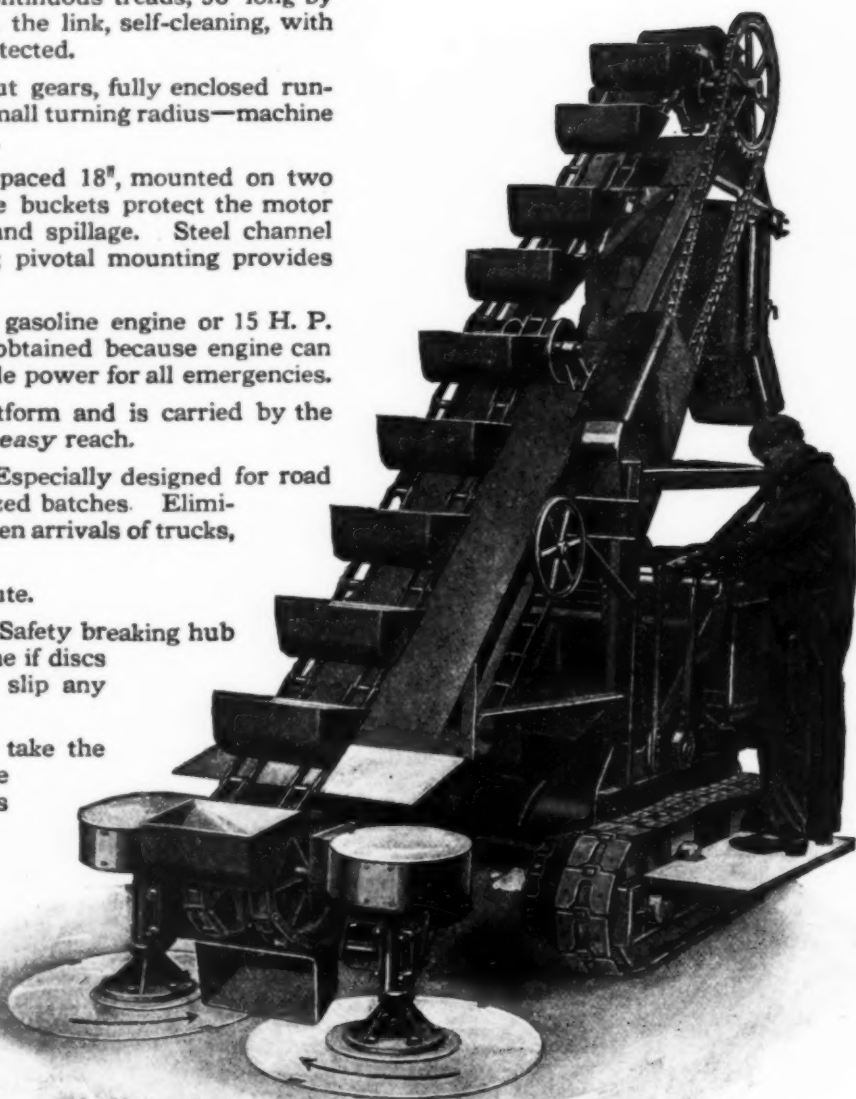
Control—Operator stands on a platform and is carried by the machine. All controls are within easy reach.

Standard Measuring Hopper—Especially designed for road contractors. Measures various sized batches. Eliminates waits for loads. Filled between arrivals of trucks, it can be emptied immediately.

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Safety—Moving parts protected. Safety breaking hub on elevator. No danger to machine if discs strike an obstruction. Discs will slip any overload.

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Besides saving in replacing men, the loader saves by loading quickly and thus reducing the waiting time of trucks. The Kane County Commissioners, Kane County, Illinois, use a fleet of big trucks and a B-G Loader in gravel road maintenance. They operate several pits, working from the one nearest the road to be repaired. By reducing the length of the haul and waiting time of trucks, much money is saved.

For loading gravel and sand from stock piles on the subgrade, at central storage plants, crushing plants, building material yards, or wherever bulk materials have to be moved, the B-G Loader, can show a saving over any other method. The R. F. Conway Company did the work of 14 men at a great saving with one B-G Loader at their central storage plant on the Chicago-Milwaukee road last summer.

Results secured in 1920 by several other road contractors using B-G Loaders are given in a booklet containing cost analyses of:

- Subgrade storage and loading with tructractors.
- Subgrade storage and loading with Ford trucks.
- Subgrade storage and loading with horse carts.
- Central proportioning plant with truck haulage of dry batch to mixer on the subgrade.
- Central mixing plant with truck haulage of wet mix.

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